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10/650,338	08/27/2003	Yusuke Hirakawa	H-5027	6839

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EXAMINER	
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ART UNIT	**PAPER NUMBER**
2164	

DATE MAILED: 12/29/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/650,338	HIRAKAWA ET AL.	
	Examiner	Art Unit	
	Sathyanarayan Pannala	2164	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 November 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-54* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) *47-54* is/are allowed.

6)☒ Claim(s) *1-3,5,7-10,12-16-19,21,23-31,33,35-37 and 39-46* is/are rejected.

7)☐ Claim(s) *4,6,11,20,22,32,34 and 38* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *10/6/05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Applicant's amendment filed on 11/3/2005. Claims 1-6, 8, 11-12, 17-22, 24, 25, 29-34, 36, 37, and 40 have been amended and claims 43-54 have been added. In this Office Action, claims 1-54 are pending.

Information Disclosure Statement

2. The information disclosure statement (IDS) submitted on 10/6/2005 is in compliance with the provisions of 37 CFR 1.97 and has been considered by the examiner.

Drawings

3. The drawings were received on 11/3/2005. These drawings are Fig. 1 and Examiner approved it.

Specification

4. The title of the invention "Storage System" is objected since it is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

5. The specification is objected for not incorporating the drawing amendment.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.
>
> This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 1, 9, 13, 15-17, 25-26, 28-29, 37, 40 and 43-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tamatsu (USPA Pub. 2003/0074600 A1) hereinafter Tamatsu, in view of Ofek et al. (US Patent 6,598,134) hereinafter Ofek and in view of Winger et al. (US Patent 6,560,617) hereinafter Winger.

8. As per independent claim 1, Tamatsu teaches a data backup and recovery system capable of both backup and recovery in short periods of time and at low cost (page 2, paragraph [0031]). Tamatsu invention is further characterized by a primary

system that uses blocks that store sequentially records having unique key and zero or one or more non-unique keys manages the locations of these blocks by means of location tables that place them in correspondence with physical addresses in random access memory (RAM) and manages a database stored in RAM and by one or more secondary systems that provide backup blocks corresponding to the blocks containing the source data on the primary system (page 3, paragraph [0032]). Tamatsu teaches the claimed "a first storage system coupled to a host device for sending data to and receiving data from said host device, the first storage system including a plurality of disk drives and a disk adaptor used to control the disk drives" as an input-output (I/O) terminal 4 is connected to a primary system 1 via the I/O terminal communication control mechanism 16. The data is simultaneously transmitted (S3) from the I/O terminal communications control mechanism 16 to the primary backup and recovery control mechanism 14 (page 6, paragraphs [0116 and [0118]).

Further, Tamatsu teaches the claimed "a second storage system coupled to said first storage system for receiving data from said first storage system" as the primary backup and recovery control mechanism 14 transmits (S5) the log data to the secondary system 2 via the communications mechanism 13 and the network communication device 3 (page 6, paragraph [0119]). Further, tamatsu teaches the claimed "first storage system comprises a first storage area for writing the data received from said host device, the first storage area configured by at least one of the disk drives" as the data transmitted s3 from the I/O terminal communications control

mechanism 16 to the primary backup and recovery control mechanism 14 (page 6, paragraph [0118]).

Further, Tamatsu teaches the claimed "second storage area for writing the data written in said first storage area and update information relating to said data, the second storage area being configured by at least one of the disk drives" as the database control mechanism 15 updates S4 the corresponding database 18 (page 6, paragraph [0119]). Further, Tamatsu teaches the claimed "second storage system comprises a third storage area for storing the data read from said second storage area and the update information relating to said data wherein the data and update information to be stored in said third storage area are read from said first storage system" as the primary backup and recovery mechanism 14 transmits S5 the log data to the secondary system 2 via communications mechanism 13 and network communications device 3 (page 6, paragraph [0119]).

Further, Tamatsu does not explicitly teach updating second storage system at given time intervals. However, Ofek teaches the claimed "updating the second storage system" as data transfer request from the donor storage device 14 to the target storage device 16 occurs in a timely and coordinated fashion (Fig. 5, col. 12, lines 56-58). Thus, it would have been obvious to one of ordinary skill in the data processing art at the time of the present invention, to have combined the teachings of the cited references because Ofek's teachings would have allowed Tamatsu's system to perform its retrieval and updating operations during a predetermined timely fashion to allow data migration between first data storage system and a second storage system while the database is

open and in real-time, completely transparent to the host or data processing unit with minimal interruption to interact with the one or more host or data processing systems (col. 2, lines 26-31).

Tamatsu and Ofek do not explicitly teach sending a command to the first storage system. However, Winger teaches the claimed "the second storage system sends to the first storage system a command requiring the transmitting of the data stored in the second storage area and the update information relating to the data and the first storage system transmits the data stored in the second storage area and the update information relating to the data to the second storage system in response to the command" as second communication for communicating to the data modification request from at least one primary server to the at least one secondary server (col. 9, lines 27-29). Thus, it would have been obvious to one of ordinary skill in the data processing art at the time of the present invention, to have combined the teachings of the cited references because Winger's teachings would have allowed Tamatsu's system to provide continuous operation of computer systems by having redundant computers and mass storage devices (col. 1, lines 29-37).

9. As per dependent claim 9, Tamatsu teaches the claimed "a plurality of said first storage areas is provided and the information that is to be written in said second storage area is obtained by taking as an object the data that are to be written in said plurality of first storage areas" as the primary system contains primary blocks 6a-n and secondary system 2 contains backup blocks 8a-n (page 7, paragraph [0122]- [0123]).

10. As per dependent claim 13, Tamatsu teaches the claimed "second storage system has a fourth storage area corresponding to said first storage area in said first storage system and stores data in said fourth storage area based on the update information and data stored in said third storage area" as the backup blocks 8a-n in the secondary system 2 correspond to primary blocks 6a-n (Fig. 2, page 7, paragraph [0123]).

11. As per dependent claim 15, Tamatsu teaches the claimed "first storage system comprises a host adapter for sending data to and receiving data from the host device, a cache for retaining the data received by said host adapter, a disk adapter for transferring the data stored in said cache, and a plurality of disk drives for storing the data according to control of said disk adapter and said first storage area and said second storage area are allocated from a storage area in said plurality of disk drives" as the primary system 1 includes one array of storage deices (memory) provided and they are independent of and with an access speed equivalent to active array provided for backup use. Each storage device (memory) is connected to a processing device and performs reads, writes, updates and deletions when so instructed by the process device (page 7, paragraph [0121]).

12. As per dependent claim 16, Tamatsu teaches the claimed "second storage system comprises a host adapter for sending data to and receiving data from the host

device, a cache for retaining the data received by said host adapter, a disk adapter for transferring the data stored in said cache, and a plurality of disk drives for storing the data according to said disk adapter control and said third storage area is allocated from a storage area in said plurality of disk drives" as the primary system 1 includes one array of storage deices (memory) provided and they are independent of and with an access speed equivalent to active array provided for backup use. Each storage device (memory) is connected to a processing device and performs reads, writes, updates and deletions when so instructed by the process device (page 7, paragraph [0121]).

13. As per independent claim 17, Tamatsu teaches a data backup and recovery system capable of both backup and recovery in short periods of time and at low cost (page 2, paragraph [0031]). Tamatsu invention is further characterized by a primary system that uses blocks that store sequentially records having unique key and zero or one or more non-unique keys manages the locations of these blocks by means of location tables that place them in correspondence with physical addresses in random access memory (RAM) and manages a database stored in RAM and by one or more secondary systems that provide backup blocks corresponding to the blocks containing the source data on the primary system (page 3, paragraph [0032]).

Further, Tamatsu teaches the claimed "a first storage system coupled to a host device for sending data to and configured to receive data from said host device, the first storage system including a plurality of disk drives and a disk adaptor used to control the disk drives" as an input-output (I/O) terminal 4 is connected to a primary system 1 via

the I/O terminal communication control mechanism 16. The data is simultaneously transmitted (S3) from the I/O terminal communications control mechanism 16 to the primary backup and recovery control mechanism 14 (page 6, paragraphs [0116 and [0118]).

Further, Tamatsu teaches the claimed "a second storage system coupled to said first storage system for receiving data from said first storage system" as the primary backup and recovery control mechanism 14 transmits (S5) the log data to the secondary system 2 via the communications mechanism 13 and the network communication device 3 (page 6, paragraph [0119]). Further, tamatsu teaches the claimed "a third storage system coupled to said second storage system for receiving data from said second storage system" as a given implementation may be provided with multiple secondary systems 2 (Fig. 1, page 6, paragraph [0117]). Further, tamatsu teaches the claimed "first storage system comprises a first storage area for writing data received from said host device" as the data transmitted s3 from the I/O terminal communications control mechanism 16 to the primary backup and recovery control mechanism 14 (page 6, paragraph [0118]).

Further, Tamatsu teaches the claimed "second storage system comprises a second storage area for writing the data written in said first storage area in said first storage system and update information relating to said data" as the database control mechanism 15 updates S4 the corresponding database 18 (page 6, paragraph [0119]). Further, Tamatsu teaches the claimed "third storage system comprises a third storage area for storing the data read from said second storage area in said second storage

system and update information relating to said data" as a given implementation may be provided with multiple secondary systems 2 (Fig. 1, page 6, paragraph [0117]).

Further, Tamatsu does not explicitly teach updating second storage system at given time intervals. However, Ofek teaches the claimed "the data and update information to be stored in said third storage area are read from said second storage system" as data transfer request from the donor storage device 14 to the target storage device 16 occurs in a timely and coordinated fashion (Fig. 5, col. 12, lines 56-58). Thus, it would have been obvious to one of ordinary skill in the data processing art at the time of the present invention, to have combined the teachings of the cited references because Ofek's teachings would have allowed Tamatsu's system to perform its retrieval and updating operations during a predetermined timely fashion to allow data migration between first data storage system and a second storage system while the database is open and in real-time, completely transparent to the host or data processing unit with minimal interruption to interact with the one or more host or data processing systems (col. 2, lines 26-31).

Tamatsu and Ofek do not explicitly teach sending a command to the first storage system. However, Winger teaches the claimed "the third storage system transmits a command to the second storage system and the second storage system transmits the data stored in the second storage area and the update information relating to the data in response to the command" as second communication for communicating to the data modification request from at least one primary server to the at least one secondary server (col. 9, lines 27-29). Thus, it would have been obvious to one of ordinary skill in

the data processing art at the time of the present invention, to have combined the teachings of the cited references because Winger's teachings would have allowed Tamatsu's system to provide continuous operation of computer systems by having redundant computers and mass storage devices (col. 1, lines 29-37).

14. As per dependent claim 25, Tamatsu and Ofek do not explicitly teach sending a command to the first storage system. However, Winger teaches the claimed "the third storage system transmits a command to the second storage system at certain intervals" as second communication for communicating to the data modification request from at least one primary server to the at least one secondary server (col. 9, lines 27-29). Thus, it would have been obvious to one of ordinary skill in the data processing art at the time of the present invention, to have combined the teachings of the cited references because Winger's teachings would have allowed Tamatsu's system to provide continuous operation of computer systems by having redundant computers and mass storage devices (col. 1, lines 29-37).

15. As per dependent claim 26, Tamatsu teaches the claimed "third storage system has a fourth storage area corresponding to said first storage area in said first storage system and stores data in said fourth storage area based on the data and update information stored in said third storage area" as the backup blocks 8a-n in the

secondary system 2 correspond to primary blocks 6a-n (Fig. 2, page 7, paragraph [0123]).

16. As per dependent claim 28, Tamatsu teaches the claimed "first storage system has written data sent from said host device to said first storage area, the first storage system transmits the data written in said first storage area to said second storage system and said second storage system writes the data written in said first storage area of said first storage system and update information relating to said data into said second storage area" as the primary system contains primary blocks 6a-n and secondary system 2 contains backup blocks 8a-n (page 7, paragraph [0122]- [0123]).

17. As per independent claim 29, Tamatsu teaches a data backup and recovery system capable of both backup and recovery in short periods of time and at low cost (page 2, paragraph [0031]). Tamatsu invention is further characterized by a primary system that uses blocks that store sequentially records having unique key and zero or one or more non-unique keys manages the locations of these blocks by means of location tables that place them in correspondence with physical addresses in random access memory (RAM) and manages a database stored in RAM and by one or more secondary systems that provide backup blocks corresponding to the blocks containing the source data on the primary system (page 3, paragraph [0032]). Tamatsu teaches the claimed "a first storage system coupled to a host device for sending data to and receiving data from said host device" as an input-output (I/O) terminal 4 is connected to

a primary system 1 via the I/O terminal communication control mechanism 16. The data is simultaneously transmitted (S3) from the I/O terminal communications control mechanism 16 to the primary backup and recovery control mechanism 14 (page 6, paragraphs [0116 and [0118]).

Further, Tamatsu teaches the claimed "a second storage system coupled to said first storage system for receiving data from said first storage system" as the primary backup and recovery control mechanism 14 transmits (S5) the log data to the secondary system 2 via the communications mechanism 13 and the network communication device 3 (page 6, paragraph [0119]). Further, tamatsu teaches the claimed "a third storage system coupled to said second storage system for receiving data from said second storage system" as a given implementation may be provided with multiple secondary systems 2 (Fig. 1, page 6, paragraph [0117]). Further, Tamatsu teaches the claimed "wherein said first storage system comprises a first storage area for writing data received from said host device" as an input-output (I/O) terminal 4 is connected to a primary system 1 via the I/O terminal communication control mechanism 16. The data is simultaneously transmitted (S3) from the I/O terminal communications control mechanism 16 to the primary backup and recovery control mechanism 14 (page 6, paragraphs [0116 and [0118]).

Further, Tamatsu teaches the claimed "second storage system comprises a second storage area for writing data received from said first storage system and a third storage area for writing the data written into said second storage area and update information relating to said data" as the primary backup and recovery control

mechanism 14 transmits (S5) the log data to the secondary system 2 via the communications mechanism 13 and the network communication device 3 (page 6, paragraph [0119]). Further, tamatsu teaches the claimed "third storage system comprises a fourth storage area for storing data read from said third storage area in said second storage system and update information relating to said data" as the primary backup and recovery control mechanism 14 transmits (S5) the log data to the secondary system 2 via the communications mechanism 13 and the network communication device 3 and as a given implementation may be provided with multiple secondary systems 2 (Fig. 1, page 6, paragraph [0117 and 0119]).

Further, Tamatsu does not explicitly teach updating second storage system at given time intervals. However, Ofek teaches the claimed "the data and update information to be stored in said fourth storage area are read from said third storage system" as data transfer request from the donor storage device 14 to the target storage device 16 occurs in a timely and coordinated fashion (Fig. 5, col. 12, lines 56-58). Thus, it would have been obvious to one of ordinary skill in the data processing art at the time of the present invention, to have combined the teachings of the cited references because Ofek's teachings would have allowed Tamatsu's system to perform its retrieval and updating operations during a predetermined timely fashion to allow data migration between first data storage system and a second storage system while the database is open and in real-time, completely transparent to the host or data processing unit with minimal interruption to interact with the one or more host or data processing systems (col. 2, lines 26-31).

Tamatsu and Ofek do not explicitly teach sending a command to the second storage system. However, Winger teaches the claimed "the third storage system transmits a command to the second storage system and the second storage system transmits the data stored in the second storage area and the update information relating to the data in response to the command" as second communication for communicating to the data modification request from at least one primary server to the at least one secondary server (col. 9, lines 27-29). Thus, it would have been obvious to one of ordinary skill in the data processing art at the time of the present invention, to have combined the teachings of the cited references because Winger's teachings would have allowed Tamatsu's system to provide continuous operation of computer systems by having redundant computers and mass storage devices (col. 1, lines 29-37).

18. As per dependent claim 37, Tamatsu and Ofek do not explicitly teach sending a command to the first storage system. However, Winger teaches the claimed "the third storage system transmits a command to the second storage system at certain intervals" as second communication for communicating to the data modification request from at least one primary server to the at least one secondary server (col. 9, lines 27-29). Thus, it would have been obvious to one of ordinary skill in the data processing art at the time of the present invention, to have combined the teachings of the cited references because Winger's teachings would have allowed Tamatsu's system to provide continuous operation of computer systems by having redundant computers and mass storage devices (col. 1, lines 29-37).

19. As per independent claim 40, Tamatsu teaches a data backup and recovery system capable of both backup and recovery in short periods of time and at low cost (page 2, paragraph [0031]). Tamatsu invention is further characterized by a primary system that uses blocks that store sequentially records having unique key and zero or one or more non-unique keys manages the locations of these blocks by means of location tables that place them in correspondence with physical addresses in random access memory (RAM) and manages a database stored in RAM and by one or more secondary systems that provide backup blocks corresponding to the blocks containing the source data on the primary system (page 3, paragraph [0032]). Tamatsu teaches the claimed "a network interface used to coupled the storage system to a remote computer system" as RAM 12 and a communications mechanism 13 are connected by bus line 19 (Fig. 2, page 7, paragraph [0122]). Further, Tamatsu teaches the claimed "a plurality of storage devices configured to store data or management information" as the databases 18 each contain a primary location table 5 and primary blocks 6a-n (Fig. 1, page 7, paragraph [0122]). Further, Tamatsu teaches the claimed "a storage adaptor configured to control the plurality of storage devices" primary location table 5 has registered block numbers 6a-n (Fig. 3, page 7, paragraph [0124]). Further, Tamatsu teaches the claimed "a first storage area defined on at least one of the storage devices the first storage area being configured to store write data transmitted by the host" as an input-output (I/O) terminal 4 is connected to a primary system 1 via the I/O terminal communication control mechanism 16. The data is simultaneously transmitted (S3) from the I/O terminal communications control mechanism 16 to the primary backup and

recovery control mechanism 14 (page 6, paragraphs [0116 and [0118]). Further, Tamatsu teaches the claimed "a second storage area defined on at least one of the storage devices, the second storage area being configured to store a journal, the journal including journal data and update information corresponding to the journal data, the journal data corresponding to the write data, wherein the storage system transmits the journal stored in the second storage area to a remote storage system for data mirroring, the journal being stored in a third storage area of the remote storage system" as the primary backup and recovery mechanism 14 transmits S5 the log data to the secondary system 2 via communications mechanism 13 and network communications device 3 (page 6, paragraph [0119]).

Tamatsu and Ofek do not explicitly teach sending a command to the first storage system. However, Winger teaches the claimed "the remote storage system sends to the storage system a command requiring the transmitting of the data stored in the second storage area and the update information relating to the data and the storage system transmits the data stored in the second storage area and the update information relating to the data to the remote storage system in response to the command" as second communication for communicating to the data modification request from at least one primary server to the at least one secondary server (col. 9, lines 27-29). Thus, it would have been obvious to one of ordinary skill in the data processing art at the time of the present invention, to have combined the teachings of the cited references because Winger's teachings would have allowed Tamatsu's system to provide continuous

operation of computer systems by having redundant computers and mass storage devices (col. 1, lines 29-37).

20. As per dependent claim 43, Tamatsu and Ofek do not explicitly teach sending a command to the first storage system. However, Winger teaches the claimed "the sending the command from the second storage system to the first storage system and the transmitting the data from the first storage system to the second storage system are processed at different timing about different data received from the host device to first storage system during different time periods" as second communication for communicating to the data modification request from at least one primary server to the at least one secondary server (col. 9, lines 27-29). Thus, it would have been obvious to one of ordinary skill in the data processing art at the time of the present invention, to have combined the teachings of the cited references because Winger's teachings would have allowed Tamatsu's system to provide continuous operation of computer systems by having redundant computers and mass storage devices (col. 1, lines 29-37).

21. As per dependent claim 44, Tamatsu and Ofek do not explicitly teach sending a command to the first storage system. However, Winger teaches the claimed "the transmitting the command from the third storage system to the second storage system and the transmitting the data from the second storage system to the third storage system are processed at different timing about different data received from the host device to the first storage system during different time periods" as second

communication for communicating to the data modification request from at least one primary server to the at least one secondary server (col. 9, lines 27-29). Thus, it would have been obvious to one of ordinary skill in the data processing art at the time of the present invention, to have combined the teachings of the cited references because Winger's teachings would have allowed Tamatsu's system to provide continuous operation of computer systems by having redundant computers and mass storage devices (col. 1, lines 29-37).

22. As per dependent claim 45, Tamatsu and Ofek do not explicitly teach sending a command to the first storage system. However, Winger teaches the claimed "the transmitting the command from the third storage system to the second storage system and the transmitting the data from the second storage system to the third storage system are processed at different timing about different data received from the host device to the first storage system during different time periods" as second communication for communicating to the data modification request from at least one primary server to the at least one secondary server (col. 9, lines 27-29). Thus, it would have been obvious to one of ordinary skill in the data processing art at the time of the present invention, to have combined the teachings of the cited references because Winger's teachings would have allowed Tamatsu's system to provide continuous operation of computer systems by having redundant computers and mass storage devices (col. 1, lines 29-37).

23. As per dependent claim 46, Tamatsu and Ofek do not explicitly teach sending a command to the first storage system. However, Winger teaches the claimed "the sending the command from the remote storage system to the storage system and the transmitting the journal from the storage system to the remote storage system are processed at different timing about different data transmitted from the host to the storage system during different time periods" as second communication for communicating to the data modification request from at least one primary server to the at least one secondary server (col. 9, lines 27-29). Thus, it would have been obvious to one of ordinary skill in the data processing art at the time of the present invention, to have combined the teachings of the cited references because Winger's teachings would have allowed Tamatsu's system to provide continuous operation of computer systems by having redundant computers and mass storage devices (col. 1, lines 29-37).

24. Claims 2, 12, 18 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tamatsu (USPA Pub. 2003/0074600 A1) hereinafter Tamatsu, in view of Ofek et al. (US Patent 6,598,134) hereinafter Ofek, in view of Winger et al. (US Patent 6,560,617) hereinafter Winger and in view of Duyabovich et al. (US Patent 5,555,371) hereinafter Duyabovich.

25. As per dependent claim 2, Tamatsu, Ofek and Winger do not explicitly teach updating the secondary storage on basis of time interval according to number of data. However, Duyabovich teaches the claimed "the data and update information to be

stored in the third storage area are read from the first storage system at various time intervals, second storage system defines said time intervals according to a number of data read from said second storage area, wherein said second storage area includes a first region for storing the update information and a second region for storing the data, wherein said second storage system further includes a fourth storage area to store the data obtained from the third storage area without the update information" as each update is initiated based on selected time intervals during updating, predetermined number of data processing operations have been executed (Fig. 1, col. 8, lines 48-55). Thus, it would have been obvious to one of ordinary skill in the data processing art at the time of the present invention, to have, combined the teachings of the cited references because Duyabovich's teachings would have allowed Tamatsu's system to perform its retrieval and updating operations during a predetermined time will provide a point in time copying of selected storage based data sets on an non-application disruptive basis (col. 3, lines 65-67).

26. As per dependent claim 12, Tamatsu, Ofek and Winger do not explicitly teach updating the secondary storage on basis of time interval according to number of data. However, Duyabovich teaches the claimed "second storage system sends to the first storage system at certain time intervals a command requiring the transmitting of the data stored in said second storage area and the update information relating to the data" as In step 9, primary data-storage system 13 supplies the pending write update session ID to the requesting host and sending a copy update data to secondary system 2 (Fig.

1, col. 8, lines 65-67). Thus, it would have been obvious to one of ordinary skill in the data processing art at the time of the present invention, to have, combined the teachings of the cited references because Duyabovich's teachings would have allowed Tamatsu's system to perform its retrieval and updating operations during a predetermined time will provide a point in time copying of selected storage based data sets on an non-application disruptive basis (col. 3, lines 65-67).

27. As per dependent claim 18, Tamatsu, Ofek and Winger do not explicitly teach updating the secondary storage on basis of time interval according to number of data. However, Duyabovich teaches the claimed "the data update information to be stored in the third storage area are read from the second storage system at various time intervals and third storage system defines said time intervals according to a number of data read from said second storage area" as each update is initiated based on selected time intervals during updating, predetermined number of data processing operations have been executed (Fig. 1, col. 8, lines 48-55). Thus, it would have been obvious to one of ordinary skill in the data processing art at the time of the present invention, to have, combined the teachings of the cited references because Duyabovich's teachings would have allowed Tamatsu's system to perform its retrieval and updating operations during a predetermined time will provide a point in time copying of selected storage based data sets on an non-application disruptive basis (col. 3, lines 65-67).

28. As per dependent claim 30, Tamatsu, Ofek and Winger do not explicitly teach updating the secondary storage on basis of time interval according to number of data. However, Duyabovich teaches the claimed "the data update information to be stored in the third storage area are read from the second storage system at various time intervals and the third storage system sets said time intervals according to a number of data read from said third storage area" as each update is initiated based on selected time intervals during updating, predetermined number of data processing operations have been executed (Fig. 1, col. 8, lines 48-55). Thus, it would have been obvious to one of ordinary skill in the data processing art at the time of the present invention, to have, combined the teachings of the cited references because Duyabovich's teachings would have allowed Tamatsu's system to perform its retrieval and updating operations during a predetermined time will provide a point in time copying of selected storage based data sets on an non-application disruptive basis (col. 3, lines 65-67).

29. Claims 3, 5, 14, 19, 21, 27, 31, 33, 39,41-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tamatsu (USPA Pub. 2003/0074600 A1) hereinafter Tamatsu, in view of Ofek et al. (US Patent 6,598,134) hereinafter Ofek, in view of Winger et al. (US Patent 6,560,617) hereinafter Winger and in view of Yang (USPA Pub. 2004/0117344 A1) hereinafter Yang.

30. As per dependent claim 3, Tamatsu, Ofek and Winger do not explicitly teach updating the secondary storage on basis of time interval according to a traffic of data.

However, Yang teaches the claimed "the data and update information to be stored in the third storage area are read from the first storage system at various time intervals, second storage system defines said time intervals according to a traffic of data sent and received between said first storage system and said second storage system, wherein said second storage area includes a first region for storing the update information and a second region for storing the data, wherein said second storage system further includes a fourth storage area to store the data obtained from the third storage area without the update information" as when there is less local contention, network traffic contention becomes more distinguishable than local resource contention (Fig. 5, page 3, paragraph [0038]). Thus, it would have been obvious to one of ordinary skill in the data processing art at the time of the present invention, to have, combined the teachings of the cited references because Yang's teachings would have allowed Tamatsu's system to perform its retrieval and updating operations during a predetermined time based on low network traffic is economical and efficient, it can do the entire system-wide real-time, online for minimal cost of a device driver (page 1, paragraph [0011]).

31. As per dependent claim 5, Tamatsu, Ofek and Winger do not explicitly teach updating the secondary storage on basis of time interval according to a processing load. However, Yang teaches the claimed "the data and update information to be stored in the third storage area are read from the first storage system at various time intervals, second storage system defines said time intervals according to a processing load of said second storage system, wherein said second storage area includes a first region

for storing the update information and a second region for storing the data, wherein said second storage system further includes a fourth storage area to store the data obtained from the third storage area without the update information" as the graph shows a burst-write performance under different workloads and different time intervals. Whenever there is less local contention, network traffic contention becomes more distinguishable than local resource contention (Fig. 4-5, page 3, paragraph [0038]). Thus, it would have been obvious to one of ordinary skill in the data processing art at the time of the present invention, to have, combined the teachings of the cited references because Yang's teachings would have allowed Tamatsu's system to perform its retrieval and updating operations during a predetermined time based on low network traffic is economical and efficient, it can do the entire system-wide real-time, online for minimal cost of a device driver (page 1, paragraph [0011]).

32. As per dependent claim 14, Tamatsu, Ofek and Winger do not explicitly teach updating the secondary storage on basis of time interval according to a processing load. However, Yang teaches the claimed "second storage system controls the timing of the process for storing data in said fourth storage area according to a processing load of said second storage system" as the graph shows a burst-write performance under different workloads and different time intervals. Whenever there is less local contention, network traffic contention becomes more distinguishable than local resource contention (Fig. 4-5, page 3, paragraph [0038]). Thus, it would have been obvious to one of ordinary skill in the data processing art at the time of the present invention, to have,

combined the teachings of the cited references because Yang's teachings would have allowed Tamatsu's system to perform its retrieval and updating operations during a predetermined time based on low network traffic is economical and efficient, it can do the entire system-wide real-time, online for minimal cost of a device driver (page 1, paragraph [0011]).

33. As per dependent claim 19, Tamatsu, Ofek and Winger do not explicitly teach updating the secondary storage on basis of time interval according to a traffic of data. However, Yang teaches the claimed "the data and update information to be stored in the third storage area are read from the second storage system at various time intervals and third storage system defines said time intervals according to a data traffic exchanged between said second storage system and said third storage system" 19. As per dependent claim 19, Tamatsu and Ofek do not explicitly teach updating the secondary storage on basis of time interval according to a traffic of data. However, Duyabovich teaches the claimed "third storage system defines said time intervals according to a data traffic exchanged between said second storage system and said third storage system" as primary system 1 sends a notice to primary data-storage system 13 to set up a pending write update session for a range of logical addresses, viz logical volume identification, logical track identification (Fig. 1, col. 8, lines 56-60). Thus, it would have been obvious to one of ordinary skill in the data processing art at the time of the present invention, to have, combined the teachings of the cited references because Duyabovich's teachings would have allowed Tamatsu's system to

perform its retrieval and updating operations during a predetermined time will provide a point in time copying of selected storage based data sets on an non-application disruptive basis (col. 3, lines 65-67).

34. As per dependent claim 21, Tamatsu, Ofek and Winger do not explicitly teach updating the secondary storage on basis of time interval according to a processing load. However, Yang teaches the claimed "the data and update information to be stored in the third storage area are read from the second storage system at various time intervals and third storage system defines said time intervals according to a processing load of said third storage system" as the graph shows a burst-write performance under different workloads and different time intervals. Whenever there is less local contention, network traffic contention becomes more distinguishable than local resource contention (Fig. 4-5, page 3, paragraph [0038]). Thus, it would have been obvious to one of ordinary skill in the data processing art at the time of the present invention, to have, combined the teachings of the cited references because Yang's teachings would have allowed Tamatsu's system to perform its retrieval and updating operations during a predetermined time based on low network traffic is economical and efficient, it can do the entire system-wide real-time, online for minimal cost of a device driver (page 1, paragraph [0011]).

35. As per dependent claim 27, Tamatsu, Ofek and Winger do not explicitly teach updating the secondary storage on basis of time interval according to a processing load.

However, Yang teaches the claimed "third storage system controls the timing of the process for storing data in said fourth storage area according to a processing load of said third storage system" as the graph shows a burst-write performance under different workloads and different time intervals. Whenever there is less local contention, network traffic contention becomes more distinguishable than local resource contention (Fig. 4-5, page 3, paragraph [0038]). Thus, it would have been obvious to one of ordinary skill in the data processing art at the time of the present invention, to have, combined the teachings of the cited references because Yang's teachings would have allowed Tamatsu's system to perform its retrieval and updating operations during a predetermined time based on low network traffic is economical and efficient, it can do the entire system-wide real-time, online for minimal cost of a device driver (page 1, paragraph [0011]).

36. As per dependent claim 31, Tamatsu, Ofek and Winger do not explicitly teach updating the secondary storage on basis of time interval according to a traffic data. However, Yang teaches the claimed "the data and update information to be stored in the fourth storage area are read from the third storage system at various time intervals and third storage system sets said time intervals according to a data traffic exchanged between said second storage system and said third storage system" as the graph shows a burst-write performance under different workloads and different time intervals. Whenever there is less local contention, network traffic contention becomes more distinguishable than local resource contention (Fig. 4-5, page 3, paragraph [0038]).

Thus, it would have been obvious to one of ordinary skill in the data processing art at the time of the present invention, to have, combined the teachings of the cited references because Yang's teachings would have allowed Tamatsu's system to perform its retrieval and updating operations during a predetermined time based on low network traffic is economical and efficient, it can do the entire system-wide real-time, online for minimal cost of a device driver (page 1, paragraph [0011]).

37. As per dependent claim 33, Tamatsu, Ofek and Winger do not explicitly teach updating the secondary storage on basis of time interval according to a processing load. However, Yang teaches the claimed "the data update information to be stored in the fourth storage area are read from the third storage system at various time intervals and third storage system sets said time intervals according to a processing load of said third storage system" as the graph shows a burst-write performance under different workloads and different time intervals. Whenever there is less local contention, network traffic contention becomes more distinguishable than local resource contention (Fig. 4-5, page 3, paragraph [0038]). Thus, it would have been obvious to one of ordinary skill in the data processing art at the time of the present invention, to have, combined the teachings of the cited references because Yang's teachings would have allowed Tamatsu's system to perform its retrieval and updating operations during a predetermined time based on low network traffic is economical and efficient, it can do the entire system-wide real-time, online for minimal cost of a device driver (page 1, paragraph [0011]).

38. As per dependent claim 39, Tamatsu, Ofek and Winger do not explicitly teach updating the secondary storage on basis of time interval according to a processing load. However, Yang teaches the claimed "third storage system controls the timing of the process for storing data in said fifth storage area according to a processing load of said third storage system" as the graph shows a burst-write performance under different workloads and different time intervals. Whenever there is less local contention, network traffic contention becomes more distinguishable than local resource contention (Fig. 4-5, page 3, paragraph [0038]). Thus, it would have been obvious to one of ordinary skill in the data processing art at the time of the present invention, to have, combined the teachings of the cited references because Yang's teachings would have allowed Tamatsu's system to perform its retrieval and updating operations during a predetermined time based on low network traffic is economical and efficient, it can do the entire system-wide real-time, online for minimal cost of a device driver (page 1, paragraph [0011]).

39. As per dependent claim 41, Tamatsu, Ofek and Winger do not explicitly teach mirroring the first storage area to remote storage system. However, Yang teaches the claimed "the write data of the journal is stored in a fourth storage area of the remote storage system to mirror the first storage area of the storage systems the fourth storage area not including the update information, wherein the storage system is a disk array unit, the network interface is a host adaptor or channel adaptor, the storage devices are

hard disk drives, and the storage adaptor is a disk adaptor" as local system 12 and a remote system 14 which are connected via a communication s medium 16 for example, LAN,WAN, internet. Disk driver 20 interfaces with a disk-caching-disk (DCD) device driver 22, which communicates with a real-time online remote information backup (ROBIB) disk driver 22. The local NIC driver 28 sends and receives the message over the network 16 to remote NIC driver 50 (Fig. 1, page 1, paragraph [0018], [0019] and page 2, paragraph [0025]). Thus, it would have been obvious to one of ordinary skill in the data processing art at the time of the present invention, to have, combined the teachings of the cited references because Yang's teachings would have allowed Tamatsu's system to perform remote online backup without time consuming and difficult task for the database administrator (page 1, paragraph [0007]).

40. As per dependent claim 42, Tamatsu, Ofek and Winger do not explicitly teach mirroring the first storage area to remote storage system. However, Yang teaches the claimed "the first and third storage areas are storage volumes, where the second and fourth storage areas are journal volumes each having two different reasons for storing write data and update information, respectively" as the local system 12 has disk memory 18 and the remote system 14 has disk memory 54 (Fig. 1, page 2, paragraph [0019,0022]). Thus, it would have been obvious to one of ordinary skill in the data processing art at the time of the present invention, to have, combined the teachings of the cited references because Yang's teachings would have allowed Tamatsu's system

to perform remote online backup without time consuming and difficult task for the database administrator (page 1, paragraph [0007]).

41. Claims 7-8,23-24 and 35-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tamatsu (USPA Pub. 2003/0074600 A1) hereinafter Tamatsu, in view of Ofek et al. (US Patent 6,598,134) hereinafter Ofek, in view of Winger et al. (US Patent 6,560,617) hereinafter Winger and in view of Candelaria et al. (US Patent 5,682,513) hereinafter Candelaria.

42. As per dependent claim 7, Tamatsu, Ofek and Winger do not explicitly teach updating the secondary storage according to an update sequence. However, Candelaria teaches the claimed "the update information to be written to said second storage area relates to an update sequence of the data that is to be written to said first storage area" as after all read record sets across all primary storage controllers 305 for a predetermined interval are received at the secondary site 331, the SDM 314 interprets the received control information and applies the received read record sets to the secondary DASDs 316 in groups of record updates such that the record updates were originally written on the primary DASDs 306 (Fig. 3, col. 9, lines 56-63). Thus, it would have been obvious to one of ordinary skill in the data processing art at the time of the present invention, to have, combined the teachings of the cited references because Candelaria's teachings would have allowed Tamatsu's system to perform its retrieval and updating operations during a predetermined time based on update sequence in

order to backup data at the secondary site in an order consistent with the data writes at the primary site (col. 2, lines 48-50).

43. As per dependent claim 8, Tamatsu, Ofek and Winger do not explicitly teach updating the secondary storage on basis of time interval according to management information. However, Candelaria teaches the claimed "the data update information to be stored in the third storage area are read from the second storage system at various time intervals and first storage system possesses management information relating to said second storage area and second storage system reads from said first storage system the management information relating to said second storage area which is possessed by said first storage system and defines said time intervals according to said management information" as external communication may notify the secondary site that an out-of-sync duplex pair volume exists. This is realized by employing a user systems management function (col. 6, lines 33-36). Thus, it would have been obvious to one of ordinary skill in the data processing art at the time of the present invention, to have, combined the teachings of the cited references because Candelaria's teachings would have allowed Tamatsu's system to perform its retrieval and updating operations during a predetermined time based on update sequence in order to backup data at the secondary site in an order consistent with the data writes at the primary site (col. 2, lines 48-50).

44. As per dependent claim 10, Tamatsu, Ofek and Winger do not explicitly teach updating the secondary storage according to an update sequence. However, Candelaria teaches the claimed "the update information to be written in said second storage area relates to the update sequence of the data that is to be written in said plurality of first storage areas" as after all read record sets across all primary storage controllers 305 for a predetermined interval are received at the secondary site 331, the SDM 314 interprets the received control information and applies the received read record sets to the secondary DASDs 316 in groups of record updates such that the record updates were originally written on the primary DASDs 306 (Fig. 3, col. 9, lines 56-63). Thus, it would have been obvious to one of ordinary skill in the data processing art at the time of the present invention, to have, combined the teachings of the cited references because Candelaria's teachings would have allowed Tamatsu's system to perform its retrieval and updating operations during a predetermined time based on update sequence in order to backup data at the secondary site in an order consistent with the data writes at the primary site (col. 2, lines 48-50).

45. As per dependent claim 23, Tamatsu, Ofek and Winger do not explicitly teach updating the secondary storage according to an update sequence. However, Candelaria teaches the claimed "the update information to be written into said second storage area relates to the update sequence of the data that is to be written into said second storage area" as after all read record sets across all primary storage controllers 305 for a predetermined interval are received at the secondary site 331, the SDM 314

interprets the received control information and applies the received read record sets to the secondary DASDs 316 in groups of record updates such that the record updates were originally written on the primary DASDs 306 (Fig. 3, col. 9, lines 56-63). Thus, it would have been obvious to one of ordinary skill in the data processing art at the time of the present invention, to have, combined the teachings of the cited references because Candelaria's teachings would have allowed Tamatsu's system to perform its retrieval and updating operations during a predetermined time based on update sequence in order to backup data at the secondary site in an order consistent with the data writes at the primary site (col. 2, lines 48-50).

46. As per dependent claim 24, Tamatsu, Ofek and Winger do not explicitly teach updating the secondary storage and defines time interval according to management information. However, Candelaria teaches the claimed "the data update information to be stored in the third storage area are read from the second storage system at various time intervals and second storage system possesses management information relating to said second storage area and said third storage system reads from said second storage system said management information relating to said second storage area and sets said time intervals according to said management information that has been read" as external communication may notify the secondary site that an out-of-sync duplex pair volume exists. This is realized by employing a user systems management function (col. 6, lines 33-36). Thus, it would have been obvious to one of ordinary skill in the data processing art at the time of the present invention, to have, combined the teachings of

the cited references because Candelaria's teachings would have allowed Tamatsu's system to perform its retrieval and updating operations during a predetermined time based on update sequence in order to backup data at the secondary site in an order consistent with the data writes at the primary site (col. 2, lines 48-50).

47. As per dependent claim 35, Tamatsu, Ofek and Winger do not explicitly teach updating the secondary storage according to an update sequence. However, Candelaria teaches the claimed "the update information to be written into said third storage area relates to the update sequence of the data to be written into said second storage area" as after all read record sets across all primary storage controllers 305 for a predetermined interval are received at the secondary site 331, the SDM 314 interprets the received control information and applies the received read record sets to the secondary DASDs 316 in groups of record updates such that the record updates were originally written on the primary DASDs 306 (Fig. 3, col. 9, lines 56-63). Thus, it would have been obvious to one of ordinary skill in the data processing art at the time of the present invention, to have, combined the teachings of the cited references because Candelaria's teachings would have allowed Tamatsu's system to perform its retrieval and updating operations during a predetermined time based on update sequence in order to backup data at the secondary site in an order consistent with the data writes at the primary site (col. 2, lines 48-50).

48. As per dependent claim 36, Tamatsu, Ofek and Winger do not explicitly teach updating the secondary storage and defines time interval according to management information. However, Candelaria teaches the claimed "the data update information to be stored in the third storage area are read from the second storage system at various time intervals, second storage system possesses management information relating to said third storage area and third storage system reads from said second storage system the management information relating to said third storage area and sets said time intervals according to said management information that has been read" as external communication may notify the secondary site that an out-of-sync duplex pair volume exists. This is realized by employing a user systems management function (col. 6, lines 33-36). Thus, it would have been obvious to one of ordinary skill in the data processing art at the time of the present invention, to have, combined the teachings of the cited references because Candelaria's teachings would have allowed Tamatsu's system to perform its retrieval and updating operations during a predetermined time based on update sequence in order to backup data at the secondary site in an order consistent with the data writes at the primary site (col. 2, lines 48-50).

Allowable Subject Matter

49. Claims 4, 6, 11, 20, 22, 32, 34 and 38 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

50. Claims 47-54 are allowed because the applicant has incorporated the objected dependent claims into independent claims and prior art on record does not teach each claim in combination with all limitations.

Response to Arguments

51. Applicant's arguments filed on 11/3/2005 have been fully considered but they are moot in view of the new ground(s) of rejection.

Conclusion

52. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sathyanarayan Pannala whose telephone number is (571) 272-4115. The examiner can normally be reached on 8:00 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Charles Rones can be reached on (571) 272-4085. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only.

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SRP
Sathyanarayan Pannala
Examiner
Art Unit 2164

srp
December 19, 2005

MOHAMMAD ALI
PRIMARY EXAMINER